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## INSPECTION AND ACCEPTANCE OF REINFORCING STEEL SUPPORTS

### **GENERAL**

Supports for reinforcing steel come in various sizes and types. These types have specific names such as slab bolsters, high chairs or continuous high chairs. The supports are used to hold reinforcing steel in place while concrete is being placed. They are typically made of small diameter steel rods, steel wire, or various shapes of molded plastic. They shall meet the requirements of Section 2404.07 of the Standard Specifications.

Table 1 identifies the various configurations of steel wire supports available. Table 2 lists the minimum sizes of steel wire required for the supports. Approval is based on meeting the minimum wire diameter sizes listed in Table 2.

Also, this IM provides an approved list of plastic supports. The approved brands of plastic supports have met or exceeded the load carrying capacity of the steel wire supports. Therefore, the approved plastic supports may be used at the same spacing as the steel wire supports. Appendix A lists approved brands of plastic supports. The maximum spacing for any bar support (steel or plastic) shall not exceed 4 ft.-0 in. (1.20 m).

### **APPROVAL PROCESS**

A manufacturer wishing to obtain approval shall submit the following to the Iowa Department of Transportation, Office of Materials, 800 Lincoln Way, Ames, IA 50010:

1. Technical Product Information
2. Samples:
  - For individual chairs - 5 pieces
  - For continuous support - 10 lineal feet (3 m)

### **TESTING PROCEDURE**

The testing procedure involves determining a point load limit for all supports and also a linear load limit for continuous devices.

The point load limit is determined by placing a #4 (#10 M) reinforcing bar on the support. The support is then placed on a 3/4 in. (19 mm) piece of fir plywood. A load is applied to the bar at a rate of 0.5 in. (13 mm) deflection per minute until the support fails. Point loads are determined at the weakest point on continuous supports.

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The linear load limit is determined by placing a 1 ft. (300 mm) long plate on top of the continuous support. The support is again placed on a 3/4 in. (19 mm) piece of fir plywood and loaded at 0.5 in. (13 mm) deflection per minute until the support fails.

The supports fail in one of three principle ways:

1. Breaking
2. Excessive bending or deformation - more than 1/2 in. (13 mm)
3. Excessive gouging into the plywood - more than 0.1 in. (2.5 mm)

### **MONITOR SAMPLING AND TESTING**

Samples may be secured from the project and tested to verify compliance.

TABLE 1 METRIC - TYPICAL TYPE AND SIZES OF WIRE BAR SUPPORTS

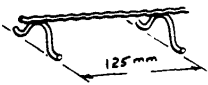
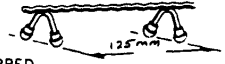
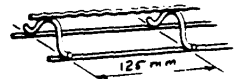


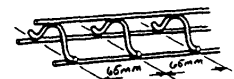


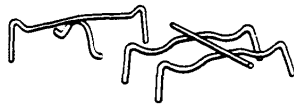




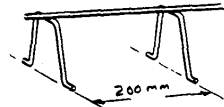
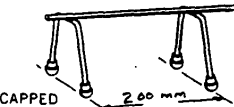
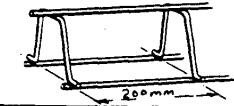

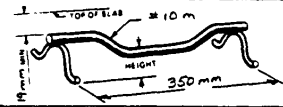
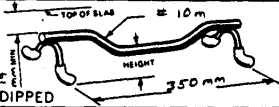
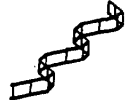
| SYMBOL | BAR SUPPORT ILLUSTRATIONS   | BAR SUPPORT ILLUSTRATION<br>PLASTIC CAPPED OR DIPPED  | TYPE OF<br>SUPPORT                   | TYPICAL SIZES   |
|--------|---|---|--------------------------------------|---|
| SB     |    | <br>CAPPED   | Slab Bolster                         | 20, 25, 40 and 50 mm heights in 1.5 and 3.0 m lengths                             |
| SBU*   |    |   | Slab Bolster Upper                   | Same as SB  |
| BB     |    | <br>CAPPED   | Beam Bolster                         | 25, 40, 50 mm over 50 to 125 mm heights in increments of 5 mm in lengths of 1.5 m |
| BBU*   |    |   | Beam Bolster Upper                   | Same as BB  |
| BC     |    | <br>DIPPED   | Individual Bar Chair                 | 20, 25, 40 and 45 mm heights  |
| JC     |   | <br>DIPPED  | Joist Chair                          | 100, 125 and 150 mm widths and 20, 25, and 40 mm heights                          |
| HC     |  | <br>CAPPED | Individual High Chair                | 50 to 375 mm heights in increments of 5 mm  |
| HCM*   |  |   | High Chair for Metal Deck            | 50 to 375 mm heights in increments of 5 mm  |
| CHC    |  | <br>CAPPED | Continuous High Chair                | Same as HC in 1.5 and 3.0 m lengths   |
| CHCU*  |  |   | Continuous High Chair Upper          | Same as CHC   |
| CHCM*  |  |   | Continuous High Chair for Metal Deck | Up to 125 mm heights in increments of 5 mm  |
| JCU**  |  | <br>DIPPED | Joist Chair Upper                    | 350 mm span heights -25 mm thru +90 vary in 5 mm increments                       |
| CS     |  |   | Continuous Support                   | 40 to 300 mm in increments of 5 mm in lengths of 2 m                              |

TABLE 2 METRIC – MINIMUM WIRE SIZES

| SYMBOL | NOMINAL HEIGHT   | CARBON STEEL        |       |        | STAIN-<br>LESS<br>STEEL | USUAL GEOMETRY   |
|--------|--|---------------------|-------|--------|-------------------------|--|
|        |  | TOP                 | LEGS  | RUNNER | LEGS                    |  |
| SB     | All  | 4 ga.<br>Corrugated | 6 ga. | –      | 8 ga.                   | Legs spaced 125 mm on center. Vertical corrugations spaced 25 mm on center.  |
| SBU    | All  | 4 ga.<br>Corrugated | 6 ga. | 7 ga.  | –                       | Same as SB.  |
| BB     | Up to 40 mm incl.  | 7 ga.               | 7 ga. | –      | 9 ga.                   | Legs spaced 65 mm on center.   |
|        | Over 40 to 50 mm incl.   | 7 ga.               | 7 ga. | –      | 8 ga.                   |  |
|        | Over 50 to 90 mm incl.   | 4 ga.               | 4 ga. | –      | 7 ga.                   |  |
|        | Over 90 mm.  | 4 ga.               | 4 ga. | –      | –                       |  |
| BBU    | Up to 50 mm incl.  | 7 ga.               | 7 ga. | 7 ga.  | –                       | Same as BB.  |
|        | Over 50 mm   | 4 ga.               | 4 ga. | 4 ga.  | –                       |  |
| BC     | All  | –                   | 7 ga. | –      | 9 ga.                   | –  |
| JC     | All  | –                   | 6 ga. | –      | 9 ga.                   | –  |
| HC     | 50 to 90 mm incl.  | –                   | 4 ga. | –      | 7 ga.                   | Legs at 20 deg. or less with vertical. When height exceeds 300 mm, legs are reinforced with welded corsswires or encircling wires.   |
|        | Over 90 to 125 mm incl.  | –                   | 4 ga. | –      | –                       |  |
|        | Over 125 to 225 mm incl.   | –                   | 2 ga. | –      | –                       |  |
|        | Over 225 to 375 mm incl.   | –                   | 0 ga. | –      | –                       |  |
| HCM    | 50 to 125 mm incl.   | –                   | 4 ga. | –      | –                       | Same as HC. The longest leg will govern the size of wire to be used.   |
|        | Over 125 to 225 mm incl.   | –                   | –     | –      | –                       |  |
|        | Over 225 to 375 mm incl.   | –                   | –     | –      | –                       |  |
| CHC    | 50 to 90 mm incl.  | 2 ga.               | 4 ga. | –      | 7 ga.                   | Legs at 20 deg. or less with vertical. All legs 210 mm on center maximum, with leg within 100 mm of end of chair, and spread between legs not less than 50% of nominal height. |
|        | Over 90 to 125 mm incl.  | 2 ga.               | 4 ga. | –      | –                       |  |
|        | Over 125 to 225 mm incl.   | 2 ga.               | 2 ga. | –      | –                       |  |
|        | Over 225 to 375 mm incl.   | 2 ga.               | 0 ga. | –      | –                       |  |
| CHCU   | 50 to 125 mm incl.   | 2 ga.               | 4 ga. | 4 ga.  | –                       | Same as CHC.   |
|        | 125 to 225 mm incl.  | 2 ga.               | 2 ga. | 4 ga.  | –                       |  |
|        | 225 to 375 mm incl.  | 2 ga.               | 0 ga. | 4 ga.  | –                       |  |
| CHCM   | Up to 50 mm incl.  | 4 ga.               | 6 ga. | –      | –                       | With 4 ga. top wire, maximum leg spacing is 125 mm on center. With 2 ga. top wire, maximum spacing is 250 mm on center.  |
|        | Up to 50 mm incl.  | 2 ga.               | 4 ga. | –      | –                       |  |
|        | Over 50 to 125 mm incl.  | 2 ga.               | 4 ga. | –      | –                       |  |
| JCU    | –25 to 90 mm incl.<br>(Measured from form to top of middle prtion of saddle bar) in 5 mm increments. | #10 m bar           | 2 ga. | –      | –                       | Legs spaced 350 mm on center. Maximum height pf JCU at support legs should be slab thickness minus 20 mm.  |
| CS     | 40 to 175 mm incl.   | 8 ga.               | 8 ga. | 8 ga.  | –                       | Legs spaced 150 mm on center, 100 mm on center at bend point. Middle runner used for heights over 175 mm.  |
|        | 125 to 300 mm incl.  | 6 ga.               | 6 ga. | 6 ga.  | –                       |  |
|        | 190 to 300 mm incl.  | 4 ga.               | 4 ga. | 4 ga.  | –                       |  |

Gauge

Decimal Equivalent (mm)

|   |      |
|---|------|
| 0 | 7.78 |
| 1 | 7.19 |
| 2 | 6.67 |
| 3 | 6.19 |
| 4 | 5.72 |
| 5 | 5.26 |
| 6 | 4.88 |
| 7 | 4.49 |
| 8 | 4.11 |
| 9 | 3.77 |

TABLE 1 ENGLISH – TYPICAL TYPE AND SIZES OF WIRE BAR SUPPORTS


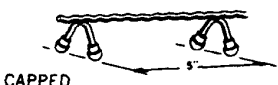









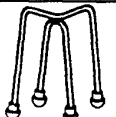
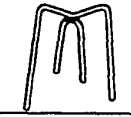


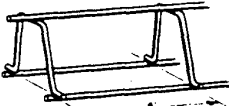
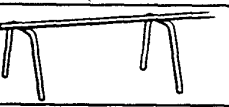
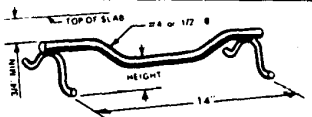
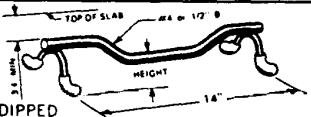
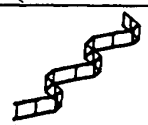
| SYMBOL | BAR SUPPORT ILLUSTRATION  | BAR SUPPORT ILLUSTRATION<br>PLASTIC CAPPED OR DIPPED  | TYPE OF<br>SUPPORT                   | TYPICAL SIZES  |
|--------|---|---|--------------------------------------|--|
| SB     |    | <br>CAPPED         | Slab Bolster                         | $\frac{3}{4}$ , 1, 1½, and 2 inch heights in 5 ft. and 10 ft. lengths                |
| SBU    |    |   | Slab Bolster Upper                   | Same as SB   |
| BB     |    | <br>CAPPED         | Beam Bolster                         | 1, 1½, 2, over 2" to 5" heights in increments of $\frac{1}{4}$ " in lengths of 5 ft. |
| BBU*   |    |   | Beam Bolster Upper                   | Same as BB   |
| BC     |    | <br>DIPPED         | Individual Bar Chair                 | $\frac{3}{4}$ , 1, 1½, and 1¾ inch heights   |
| JC     |    | <br>DIPPED DIPPED | Joist Chair                          | 4, 5, and 6 inch widths and $\frac{3}{4}$ , 1 and 1½ inch heights                    |
| HC     |   | <br>CAPPED        | Individual High Chair                | 2 to 15 inch heights in increments of $\frac{1}{4}$ inch                             |
| HCM    |  |   | High Chair for Metal Deck            | 2 to 15 inch heights in increments of $\frac{1}{4}$ in.                              |
| CHC    |  | <br>CAPPED       | Continuous High Chair                | Same as HC in 5 foot and 10 foot lengths   |
| CHCU   |  |   | Continuous High Chair Upper          | Same as CHC  |
| CHCM*  |  |   | Continuous High Chair for Metal Deck | Up to 5 inch heights in increments of $\frac{1}{4}$ in.                              |
| JCU    |  | <br>DIPPED      | Joist Chair Upper                    | 14" Span Heights – 1" thru +3½" vary in $\frac{1}{4}$ " increments                   |
| CS     |  |   | Continuous Support                   | 1½" to 12" in increments of $\frac{1}{4}$ " in lengths of 6'-8"                      |

TABLE 2 ENGLISH - MINIMUM WIRE SIZES

| SYMBOL | NOMINAL HEIGHT   | CARBON STEEL        |       |        | STAIN-<br>LESS<br>STEEL | USUAL GEOMETRY  |
|--------|--|---------------------|-------|--------|-------------------------|---|
|        |  | TOP                 | LEGS  | RUNNER | LEGS                    |   |
| SB     | All  | 4 ga.<br>Corrugated | 6 ga. | —      | 8 ga.                   | Legs spaced 5 in. on center. Vertical corrugations spaced 1 in. on center.  |
| SBU    | All  | 4 ga.<br>Corrugated | 6 ga. | 7 ga.  | —                       | Same as SB  |
| BB     | Up to 1½" incl.  | 7 ga.               | 7 ga. | —      | 9 ga.                   | Legs spaced 2½ in. on center.   |
|        | Over 1½" to 2" incl.   | 7 ga.               | 7 ga. | —      | 8 ga.                   |   |
|        | Over 2" to 3½" incl.   | 4 ga.               | 4 ga. | —      | 7 ga.                   |   |
|        | Over 3½" to 4" incl.   | 4 ga.               | 4 ga. | —      | —                       |   |
| BBU    | Up to 2" incl.   | 7 ga.               | 7 ga. | 7 ga.  | —                       | Same as BB.   |
|        | Over 2" to 4" incl.  | 4 ga.               | 4 ga. | 4 ga.  | —                       |   |
| BC     | All  | —                   | 7 ga. | —      | 9 ga.                   | —   |
| JC     | All  | —                   | 6 ga. | —      | 9 ga.                   | —   |
| HC     | 2" to 3½" incl.  | —                   | 4 ga. | —      | 7 ga.                   | Legs at 20 deg. or less with vertical. When height exceeds 12 in., legs are reinforced with welded crosswires or encircling wires.  |
|        | Over 3½" to 5" incl.   | —                   | 4 ga. | —      | —                       |   |
|        | Over 5" to 9" incl.  | —                   | 2 ga. | —      | —                       |   |
|        | Over 9" to 15" incl.   | —                   | 0 ga. | —      | —                       |   |
| HCM    | 2" to 5" incl.   | —                   | 4 ga. | —      | —                       | Same as HC. The longest leg will govern the size of wire to be used.  |
|        | Over 5" to 9" incl.  | —                   | —     | —      | —                       |   |
|        | Over 9" to 15" incl.   | —                   | —     | —      | —                       |   |
| CHC    | 2" to 3½" incl.  | 2 ga.               | 4 ga. | —      | 7 ga.                   | Legs at 20 deg. or less with vertical. All legs 8¼ in. on center maximum, with leg within 4 in. of end of chair, and spread between legs not less than 50% of nominal height. |
|        | Over 3½" to 5" incl.   | 2 ga.               | 4 ga. | —      | —                       |   |
|        | Over 5" to 9" incl.  | 2 ga.               | 2 ga. | —      | —                       |   |
|        | Over 9" to 15" incl.   | 2 ga.               | 0 ga. | —      | —                       |   |
| CHCU   | 2" to 5" incl.   | 2 ga.               | 4 ga. | 4 ga.  | —                       | Same as CHC.  |
|        | Over 5" to 9" incl.  | 2 ga.               | 2 ga. | 4 ga.  | —                       |   |
|        | Over 9" to 15" incl.   | 2 ga.               | 0 ga. | 4 ga.  | —                       |   |
| CHCM   | Up to 2" incl.   | 4 ga.               | 6 ga. | —      | —                       | With 4 ga. top wire, maximum leg spacing is 5 in. on center.<br>With 2 ga. top wire, maximum spacing is 10 in. on center.   |
|        | Up to 2" incl.   | 2 ga.               | 4 ga. | —      | —                       |   |
|        | Over 2" to 5" incl.  | 2 ga.               | 4 ga. | —      | —                       |   |
| JCU    | -1" to +3½" incl.<br>(Measured from form to top of middle portion of saddle bar) in ¼" increments. | #4 bar or ½" ø      | 2 ga. | —      | —                       | Legs spaced 14 in. on center. Maximum height of JCU at support legs should be slab thickness minus ¾ in.  |
| CS     | 1½" to 7" incl.  | 8 ga.               | 8 ga. | 8 ga.  | —                       | Legs spaced 6 in. on center, 4 in. on center at bend point. Middle runner used for heights over 7 in.   |
|        | 5" to 12" incl.  | 6 ga.               | 6 ga. | 6 ga.  | —                       |   |
|        | 7½" to 12" incl.   | 4 ga.               | 4 ga. | 4 ga.  | —                       |   |

Gauge

Decimal Equivalent (Inches)

|   |       |
|---|-------|
| 0 | .3065 |
| 1 | .2830 |
| 2 | .2625 |
| 3 | .2437 |
| 4 | .2253 |
| 5 | .2070 |
| 6 | .1920 |
| 7 | .1770 |
| 8 | .1620 |
| 9 | .1483 |